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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.
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09/219,468 12/23/98 TREFONAS F 50351

IM22/1102

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EXAMINER

CLARKE, Y

ART UNIT	PAPER NUMBER
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1752

DATE MAILED:

11/02/00

Please find below and/or attached an Office communication concerning this application or proceeding.

Commissioner of Patents and Trademarks

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Office Action Summary

Application No.

09/219,468

Applicant(s)

TREFONAS ET AL.

Examiner

Yvette M Clarke

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136 (a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).

Status

- 1) ☒ Responsive to communication(s) filed on 07 August 2000.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1,3-5 and 7-21 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☐ Claim(s) 1,3-5 and 7-21 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claims _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are objected to by the Examiner.
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. § 119

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d).
- a) ☐ All b) ☐ Some * c) ☐ None of the CERTIFIED copies of the priority documents have been:
1. ☐ received.
2. ☐ received in Application No. (Series Code / Serial Number) _____.
3. ☐ received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

- 14) ☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. & 119(e).

Attachment(s)

- 15) ☐ Notice of References Cited (PTO-892)
- 16) ☐ Notice of Draftperson's Patent Drawing Review (PTO-948)
- 17) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 4.
- 18) ☐ Interview Summary (PTO-413) Paper No(s). _____.
- 19) ☐ Notice of Informal Patent Application (PTO-152)
- 20) ☐ Other: _____.

DETAILED ACTION

This is written in reference to application number 09/219468 filed on December 23, 1998.

Information Disclosure Statement

1. The Information Disclosure Statement filed on July 6, 2000 has been entered and fully considered.

Response to Amendment

2. Claims 2 and 6 have been canceled. Claims 1, 3-5 and 7-21 are currently pending.
3. The amendments to the claims are sufficient to overcome the claims rejections of claims 1-7 and 16 under 35 U.S.C. 112, second paragraph.

Claim Objections

4. Claim 18 is objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim. Applicant is required to cancel the claim(s), or amend the claim(s) to place the claim(s) in proper dependent form, or rewrite the claim(s) in independent form. Claim 12 has been amended to incorporate the limitations of claim 18. Therefore, claim 18 no longer furthers the claim from which it depends. Correction is requested.

Claim Rejections - 35 USC § 112

5. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter, which the applicant regards as his invention.

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6. Claims 1, 3-5 and 7-21 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. The use of the phrase "substantially free" renders the said claims indefinite. It is unclear to the examiner what the applicant means by "substantially".

Claim Rejections - 35 USC § 102

7. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

8. Claims 1, 3-5, 9, 11-12, 18-19 and 21 are rejected under 35 U.S.C. 102(b) as being anticipated by Tanabe (EP 843220 A1). Tanabe teaches a radiation sensitive composition comprising (A) a copolymer which becomes soluble in an alkali developing solution by the action of an acid, the copolymer containing the a recurring unit (I) having a structure which is decomposed by the action of an acid and a recurring unit (II) obtained from a compound having at least two (meth)acryloyl groups in the molecule by the cleavage of the carbon-carbon double bond and (B) a photoacid generator which produces an acid on being irradiated by radiation (see abstract). Preferred compounds of monomer (I) are t-butyl (meth)acrylate, tetrahydropyranyl (meth)acrylate and 2-clohexyloxycarbonylethyl (meth)acrylate (pg. 3, l. 21-49). Monomer (II) are esters of a compound having two or more hydroxyl groups in the molecule, such as a polyhydric

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alcohol, polyether diol and (meth)acrylic acid (pg. 3, l. 50-pg. 5, l. 3). The photoacid generator can be selected from onium salt compounds, sulfone compounds, sulfonate compounds, sulfonimide compounds and diazomethane compounds (pg. 5, l. 26-pg. 7, l. 11). The said composition also comprises an acid diffusion control agent. The said agent controls the diffusion of the acid generated by irradiation of the photoacid generator in resist films and greatly improves stability. Nitrogen-containing organic compounds are preferred. Examples include n-hexylamine, tri-n-butylamine, propionamide, etc. (pg. 7, l. 15-2). Example 6 exemplifies the use of a copolymer of tetrahydropyranyl methacrylate:acrylic adduct to bisphenol A diglycidyl ether:tricyclodecanyl acrylate of 30:10:60. This copolymer meets the limitations of claims 1 and 12 for a resin binder comprising a pendant photoacid labile moiety and is "substantially" free of aromatic groups. The said copolymer is admixed with a triphenylsulfonium trifluoromethanesulfonate photoacid generator and tri-n-butylamine as the acid diffusion control agent. The said composition was spin coated onto a silicon wafer and irradiated with KrF excimer laser and developed using TMAH (pg. 11, l. 55-pg. 12, l. 3; pg. 12, l. 45-pg. 13, l. 7).

9. Claims 1, 3, 5, 7-12 and 17-21 are rejected under 35 U.S.C. 102(a) as being anticipated by Sumitomo (EP 856773 A1). Sumitomo teaches a chemical amplification type positive resist composition comprising a resin component and an acid generator. Sumitomo teaches that by adding a basic compound to the composition can reduce the amount of deterioration due to deactivation of the acid caused during standing after exposure. The basic compound is preferably a basic nitrogen-containing organic

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compound such as amines as a quencher (pg. 3, l. 53-pg. 4, l. 49). Examples 1 and 2 teach the use of a composition comprising a copolymer of 1-ethoxyethyl methacrylate, isobornyl methacrylate and α -methacryloxy- γ -butyrolactone (50:30:20) (pg. 6, l. 35-pg. 7, l. 15), which meets the claim limitations of a resin binder having pendant acid labile groups and is free of aromatic groups; a diphenydisulfone as the acid generator and N-phenyldiethanolamine as the quencher, which meets the limitation of a non-aromatic amine. The said composition is coated on a silicon wafer, exposed and developed (pg. 9, l. 45-pg. 10, l. 54). Sumitomo teaches that the taught compositions are suitable for exposure using KrF excimer, ArF excimer laser and the like (pg. 13, l. 28-35).

Claim Rejections - 35 USC § 103

10. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

11. Claims 1, 3-5 and 7-21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ohsawa (US 5847218) or Watanabe (US 5876900) and further in view of Hada (US 5929271).

The prior art teachings of Ohsawa teaches a chemically amplified positive resist composition comprising an organic solvent, an alkali soluble resin, a dissolution inhibitor having an acid labile group, a sulfonium salt of a given formula (1), and a photoacid generator (c. 5, l. 9-20; c. 15, l. 34-c. 16, l. 31). Examples of the said resin include polyhydroxystyrene and derivatives thereof (c. 16, l. 32-57). Ohsawa teaches that in

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addition to the sulfonium salt of the given formula another photoacid generator can be used. Examples include oxime sulfonic acid derivatives, aryl sulfonic acid ester derivatives, pyrogallol sulfonic acid ester derivatives and n-sulfonyloxymide derivatives (c. 17, l. 29-42). The composition may further contain various additives such as carboxylic acid derivatives and nitrogenous compounds for improving PED stability, surfactants for facilitating coating and light absorbing agents for reducing irregular reflection. Suitable nitrogenous compounds include tertiary aliphatic amines like triethylamine, tripropylamine, tetramethylamine and trihexylamine (c. 20, l. 4-47). It is the examiner's position, that the use of such tertiary amine compounds constitutes a non-aromatic amine compound having 9-16 carbon atoms and also a non-aromatic amine compound having a tertiary nitrogen that is not a ring member and is substituted by at least two secondary or tertiary carbon atoms as claimed by the applicant in claims 1 and 12. The said composition is best suited for fine patterning using deep UV light of 254 to 193 nm (c. 21, l. 45-47). Ohsawa exemplifies coating the said composition onto a silicon wafer and exposing the wafer to light by means of an excimer laser.

Development is done using an aqueous solution of TMAH. It is the examiner's position that it is well-known in the art that silicon wafers are commonly used microelectronic wafer substrates. One of ordinary skill in the art would have been motivated by the teachings of Ohsawa to develop a positive working composition comprising a resin binder, a photoacid generator and a tertiary amine compound in order to develop a resist composition that is suitable at 193 nm for fine patterning.

The prior art reference of Watanabe (US 5876900) teaches a chemically amplified resist composition containing an organic solvent, a base resin in the form of a polyhydroxystyrene, a photoacid generator, a vinyl ether group containing compound, a dissolution inhibitor and a basic compound (c. 4, l. 1-20). The photoacid generator can be selected from the group consisting of onium salts, β -ketosulfonate derivatives, diazomethane derivatives and disulfone derivatives (c. 6, l. 25-c. 7, l. 18). The basic compound is added to the composition in order to suppress the diffusion rate at which the acid generated from the photoacid generator diffuses into the resist coating. Suitable examples include tertiary aliphatic amines (i.e., tri-isobutylamine, tri-n-propylamine, etc.), hybrid amines, amide derivatives and imide derivatives (c. 22, l. 46-c. 24, l. 32). It is the examiner's position, that the said tertiary amine compounds constitutes a non-aromatic amine compound having 9-16 carbon atoms and also an non-aromatic amine compound having a tertiary nitrogen that is not a ring member and is substituted by at least two secondary or tertiary carbon atoms as claimed by the applicant in claims 1 and 12. The resist composition is especially suited for fine patterning with deep UV radiation of 254-193 nm and x-ray (c. 24, l. 54-56). Watanabe exemplifies using the said composition to make an article formed on a silicon wafer, which is exposed to excimer laser and developed with an aqueous solution (c.25, l. 26-c. 26, l. 8). One of ordinary skill in the art would have been motivated by the teachings of Watanabe to develop a positive working composition comprising a resin binder, a photoacid generator and a tertiary amine compound in order to develop a resist

composition which has resolution enough to lend itself to fine processing technique and forms a resist pattern resistant to heat during etching.

Ohsawa and Watanabe as discussed above, teach all the limitations of the claims except the use of a resin binder free of aromatic groups. Hada discloses in his background of invention that the use of resinous ingredients having a benzene ring in the molecular structure such as polyhydroxystyrene in the photolithographic patterning process by using ArF excimer laser beam is difficult due to the relatively low transparency of the resin to light at a short wavelength. Acrylic resins such as polymethyl methacrylate are being used in photoresist compositions to overcome this problem. Hada teaches that polymers of an acrylic acid ester having alicyclic hydrocarbon groups in the ester forming portion, such a polymer meets the claims limitation of a polymer having pendant photolabile moieties (c. 1, l. 53-c. 2, l. 61). One of ordinary skill in the art would have been motivated to substitute an acrylic type resin as taught by Hada for the polyhydroxystyrene resin of Ohsawa or Watanabe in order to make a composition *more* suitable for fine patterning at 193 nm. This position is based on the background teachings of Hada, which are considered to be known in the art to one of ordinary skill at the time of invention.

Response to Arguments

12. Applicants argue the combination of Ohsawa or Watanabe in view of Hada is improper and that since both Ohsawa and Watanabe teach using 193 nm exposure, one of ordinary would not make any substitution. The applicants further argue that Hada fails to teach the use of an amine additive of any type. Ohsawa and Watanabe as

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discussed above teach the use of polyhydroxystyrene derivatives as suitable alkali soluble resins. Hada in his background discloses that it is well-known in the art that polyhydroxystyrene type structures are can only "hardly" be used with at 193 nm due to the relatively low transparency of the resin at short wavelengths. Hada discloses that in order to obtain a material, which is capable of UV transparency and dry etching resistance, resins having acrylic type, structures are preferable to polyhydroxystyrene. Therefore, one of ordinary skill in the art at the time of invention would have been motivated to substitute the benzene ring containing structure of either Ohsawa or Watanabe for the acrylic type resin disclosed by Hada in order to obtain an image which has improved UV transparency and dry etch resistance (see Hada c. 1, l. 48-c, 2, l. 5). Hada is only relied upon for the teachings that this is a well-known in the art of photolithography. The examiner maintains her position.

13. The examiner notes that the rejections of claims 1-5, 9-17 and 19-21 over Watanabe and Oshawa alone are hereby withdrawn.

14. Applicant's submission of an information disclosure statement under 37 CFR 1.97(c) with the fee set forth in 37 CFR 1.17(p) on July 6, 2000 has prompted the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 609(B)(2)(i). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

15. A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not

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mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

16. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Yvette M Clarke whose telephone number is 703-305-0589. The examiner can normally be reached on Monday-Thursday 7-4:30 and Alt. Friday 7-3:30.

17. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Janet Baxter can be reached on 703-308-2303. The fax phone numbers for the organization where this application or proceeding is assigned are 703-305-3599 for regular communications and 703-305-3599 for After Final communications.

18. Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0661.


JANET BAXTER
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 1700

ymc 
October 31, 1999